

Development of System to Automate Analysis of Fisheries Information from Digital Stills

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The official link for this solicitation is:

https://www.fbo.gov/index?s=opportunity&mode=form&id=35d644c4794ce7203151552e947505d3&tab=core&_cview=1

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Department of Commerce

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Description:

Summary: Image recording systems are increasingly being used by the National Marine Fisheries Service (NMFS) for a multitude of applications. These systems collect aerial images of marine mammals, images of fish catch landed on the deck of vessels, as well as underwater images of fish from a variety of platforms including Remotely Operated Vehicles (ROVs), Autonomous Underwater Vehicles (AUVs) and towed camera systems. These images are reviewed manually to collect information such as the species composition and size of individuals. The effort required to manually analyze data from these systems is both time consuming and expensive. A hardware/software system that can automate the review of these images would reduce the cost of data collection and the time needed to review images. Accuracy and consistency of data may also be improved.

Project Goals: The long term goal is to automate analysis digital still image sequences of (1) live fish underwater and (2) fish catch on vessels in order to reduce labor costs and improve timeliness of data availability. Some of the technical challenges that must be overcome are variable lighting and backgrounds and high species diversity. Fish also can be at varying distances from cameras. The goal is to develop an end-to-end software/hardware system that can be used to automate the identification and sizing of fish in still images.

Phase I Activities and Expected Deliverables:

Activities:

- Identify features of commercially important and frequently encountered fish species occurring on the West Coast off California, Oregon, and Alaska and around the Hawaiian Islands that can be used for automated classification such as shape and color patterns
- Develop and demonstrate capability to automate data collection, potentially including but not necessarily limited to:
 - o Identification of images that contain fish
 - o Species classification
 - o Abundance of individuals and individual sizes
 - o Habitat characteristics
- Quantify error associated with data generated (e.g., proportion of fish correctly identified to species; degree of error about abundance or size estimates)
- Demonstrate level of repeatability of results across multiple users with the same test data sets
- Produce a detailed report documenting methods and results, with discussion of results and identification of successes and remaining challenges

Deliverables:

- Proof of concept
- A detailed report documenting methods and results, with a discussion of results and with discussion of results and identification of successes and remaining challenges.

Phase II Activities and Expected Deliverables:

Activities:

- Prototype trials of the techniques and products developed in Phase I
- Develop one or more transferable software packages/platforms with user-friendly interface to accomplish data processing capabilities developed during Phase I activities
- Products should allow improvement in species classification performance through incorporation of new training data and information on additional species
- Products should allow analyst intervention/correction in instances where confidence in species identification is low
- Desired analysis results include:
 - o Individual fish length measurements and species identifications
 - o Summary information on species composition and length distributions collected over multiple image sequences
 - o Confidence intervals associated with individual species identifications and length measurements within a sequence and summary statistics for analysis of multiple sequences.

Deliverables:

- Detailed report on developed technology/technique under commercial conditions that provides software package(s)/platforms and operating manual.